

**CLAIMS**

Therefore, at least the following is claimed:

1        1. An apparatus for equalizing a discrete multi-tone (DMT) transmit spectrum,  
2 comprising:

3            a DMT transmitter configured to generate a plurality of DMT carrier tones and  
4 combine the plurality of carrier tones into a transmit symbol;

5            an amplifier configured to detect the transmit symbol;

6            a discrete Fourier transform (DFT) element configured to separate the transmit  
7 symbol into the plurality of carrier tones; and

8            a gain adjustment element configured to adjust each of the plurality of carrier tones  
9 based on a predefined transmit signal spectrum.

1        2. The apparatus of claim 1, wherein each DMT carrier tone is independently  
2 adjusted.

1        3. The apparatus of claim 1, wherein the gain adjustment element further  
2 comprises:

3            logic configured to measure the power on each of the plurality of carrier tones; and

4            logic configured to provide a gain scalar for each of the plurality of carrier tones.

1        4. The apparatus of claim 1, wherein the amplifier monitors local line conditions.

1       5.     The apparatus of claim 1, wherein the transmit symbol is generated prior to a  
2     start-up sequence.

1       6.     The apparatus of claim 1, wherein the transmit symbol is generated after a  
2     start-up sequence.

1       7.     The apparatus of claim 1, wherein each of the plurality of DMT carrier tones  
2     is encoded into a circular signal space constellation.

1       8.     The apparatus of claim 1, wherein each of the plurality of DMT carrier tones  
2     is encoded into a square signal space constellation.

1       9.     A method for equalizing a discrete multi-tone (DMT) transmit spectrum, the  
2     method comprising the steps of:  
3             generating a plurality of DMT carrier tones;  
4             combining the plurality of carrier tones into a transmit symbol;  
5             detecting the transmit symbol;  
6             separating the transmit symbol into the plurality of carrier tones; and  
7             adjusting each of the plurality of carrier tones based on a predefined transmit signal  
8     spectrum.

1           10. The method of claim 9, wherein the adjusting step further comprises the steps  
2           of:

3           calculating a power level for each of the tones;  
4           comparing the power level of each tone with a predetermined power level; and  
5           adjusting the power level of each tone to match the predetermined power level.

1           11. The method of claim 9, wherein the adjusting step is performed using gain  
2           scalars.

1           12. The method of claim 9, further comprising the step of monitoring a  
2           communication line to detect impedance variations, where the adjusting step is responsive to  
3           the impedance variations.

1           13. The method of claim 9, further comprising the step of generating the transmit  
2           symbol prior to a start-up sequence.

1           14. The method of claim 10, further comprising the step of generating the transmit  
2           symbol after a start-up sequence.

1           15. The method of claim 9, further comprising the step of encoding each of the  
2           plurality of DMT carrier tones into a circular signal space constellation.

1        16. The method of claim 9, further comprising the step of encoding each of the  
2        plurality of DMT carrier tones into a square signal space constellation.

1        17. An apparatus for equalizing a discrete multi-tone (DMT) transmit spectrum,  
2        comprising:

3            means for generating a plurality of DMT carrier tones;  
4            means for combining the plurality of carrier tones into a transmit symbol;  
5            means for detecting the transmit symbol;  
6            means for separating the transmit symbol into the plurality of carrier tones; and  
7            means for adjusting each of the plurality of carrier tones based on a predefined  
8        transmit signal spectrum.

1        18. The apparatus of claim 17, further comprising:

2            means for calculating a power level for each of the tones;  
3            means for comparing the power level of each tone with a predetermined power level;  
4        and  
5            means for adjusting the power level of each tone to match the predetermined power  
6        level.

1        19. The apparatus of claim 17, wherein the adjusting means uses gain scalars.

1        20. The apparatus of claim 17, further comprising means for monitoring a  
2 communication line to detect impedance variations and where the adjusting means is  
3 responsive to the impedance variations.

1        21. The apparatus of claim 17, further comprising means for generating the  
2 transmit symbol prior to a start-up sequence.

1        22. The apparatus as defined in claim 17, further comprising means for generating  
2 the transmit symbol after a start-up sequence.

1        23. The apparatus of claim 17, further comprising means for encoding each of the  
2 plurality of DMT carrier tones into a circular signal space constellation.

1        24. The apparatus of claim 17, further comprising means for encoding each of the  
2 plurality of DMT carrier tones into a square signal space constellation.

1        25. An apparatus for equalizing a transmit spectrum of a digital subscriber line  
2 (DSL) communication device, comprising:  
3            means for generating a transmit symbol;  
4            means for detecting the transmit symbol;  
5            means for separating the transmit symbol into a plurality of frequencies; and  
6            means for adjusting a power level associated with each of the plurality of frequencies  
7            based on a predefined transmit signal spectrum.

1           26. The apparatus of claim 25, wherein the communication device is quadrature  
2 amplitude modulation (QAM) modulated single carrier.

1           27. The apparatus of claim 25, wherein the communication device is carrierless  
2 amplitude/phase (CAP) modulated single carrier.

1           28. The apparatus of claim 25, wherein the means for adjusting a power level  
2 associated with each of the plurality of frequencies based on a predefined transmit signal  
3 spectrum further comprises a finite impulse response filter.

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